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NESTLÉ'S DYNAMIC FORECASTING PROCESS: ANTICIPATING RISKS AND OPPORTUNITIES

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Abstract

Nestlé's Dynamic Forecasting Process: Anticipating Risks and Opportunities

This Work Project discusses the Nestlé's *Dynamic Forecasting* Process, implemented within the organization as a way of reengineering its performance management concept and processes, so as to make it more flexible and capable to react to volatile business conditions. When stressing the importance of demand planning to reallocate resources and enhance performance, *Nescafé Dolce Gusto* comes as way of seeking improvements on this forecasts' accuracy and it is thus, by providing a more accurate model on its capsules' sales, as well as recommending adequate implementations that positively contribute to the referred Planning Process, that value is brought to the Project.

KEYWORDS: Process Reengineering; Dynamic Forecasting; Demand Plan Accuracy; Monthly Business Planning.

Index

Purpose of Project – General Overview

In the course of the current global economic environment flexibility has emerged more strongly than ever as a crucial factor for survival and success. These challenging and volatile times have prompted business leaders to review their business models in a way to serve its customers, and react to their needs, faster and more efficiently. The strategic positioning of organizations requires qualified systems for managing its internal resources so that it contributes to the company's sustainability and competitiveness. Traditional approaches to planning have proven to be obsolete. Moving towards the implementation of a business model may be the solution for the organization to adapt quickly when faced with volatility and uncertainty.

Tracing its origin back to 1905, when a merger between *Henri Nestlé's Society* and the *Anglo-Swiss Condensed Milk Company* took place, Nestlé has been since then on its way to be considered the world's largest food, nutrition and beverage company. Today it counts with a product line that includes coffee, chocolate, breakfast cereals, dairy products, bottled water, confectionary, ice cream, food seasoning, pet foods and pharmaceutical products. With main headquarters in Vevey (Switzerland) Nestlé's presence is patent in most markets, operating on more than 83 countries and employing over than 280.000 people. Being a listed company, such as Nestlé, means having to give permanent idea on where the company is heading to investors, who want to perceive if the company is worth investing in or not. Therefore, having a well defined set of plans and strategies is of great importance, especially with today's uncertainty, since it will be the lever to investment which will consequently translate into company's value through its share price or dividends.

Bearing this in mind, Nestlé decided that it was not enough to focus on a static planning that would spotlight only the current fiscal year (the Operational Plan) but instead to embrace with the framework and the tools that would help enhance flexibility: the *Dynamic Planning Framework*. The *Dynamic Planning Framework* is the source of implementation of Dynamic Planning Processes, such as the *Monthly Business Planning* Process. By resorting to such tools Nestlé intends, not only to be able to shape future demand, but to perceive how impacts such as the economic environment, marketing & sales strategies, and new product releases, may have on the final Income Statement of the company, and apply measures to cover those risks or opportunities.

This Work Project comes as an opportunity to develop a specific project at Nestlé, where I had the chance of doing an internship and contacting closely with the concept of *Dynamic Forecasting*.

What is the *Dynamic Forecasting* Process? On what does it consist? What sort of improvements is it possible to hunt for? These are some of the questions that this Work Project will approach, not only by describing what is the origin of the *Dynamic Forecasting* Process, who does it involve, but also to focus on a particular aspect of the process that may need to be reviewed and enhanced. This latter aspect deals with the Demand Planning aspect of the whole process, by acknowledging the necessity of improving the *Demand Plan Accuracy* (DPA) of a specific Nestlé Beverages business - the *Nescafé Dolce Gusto*. In this Work Project, I try to extend the acquaintance of how can data on sales of *Nescafé Dolce Gusto* machines be used to better understand and forecast the sales of the brand's capsules, specifically the caffeinated ones.

Literature Review

For many years much has been exacerbated on the challenge of managing through times of great complexity, risk and uncertainty and the need of adapting in such an environment. As it was long time ago strained by Charles Darwin ("Origin of the Species", 1859), "The species that survive are not the strongest, nor the most intelligent, but those that adapt to changes." The principle can be extended to a business. Only the ones who are able to find the appropriate tools to respond to the constant changes of the macro and microeconomic environment do survive.

For over decades, Adam Smith's theory was well embraced by organizations. This theory defended that industrial work should be reduced to its simplest and more basic tasks, and each person would specialize in a single function (Hammer and Champy, 1993). However Hammer and Champy (1993) acknowledged the fact that the theory that had been once applied had no practical application anymore. They criticize management procedures applied until the time and argue that "it is no longer necessary or desirable for companies to organize their work around Adam Smith's division of labor". Instead, given the new dynamics in the business world there should be a change from task-oriented jobs (that are becoming obsolete) towards a process reengineering. "Reengineering is the fundamental rethinking and radical design of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed." (Hammer and Champy, 1993) However, as Hammer and Champy (1993) state, for this process reengineering to be successfully implemented it should be accompanied by an appropriate information technology. According to them "the most important reengineering-

related technology" would be the "Enterprise Resource Planning (ERP), an integrated software system that supports not only individual functional areas but complete business processes." They argue that "without reengineering, information technology delivers little payoff; without information technology, little reengineering can be done."

More recently Chase (2009) brought out the fact that "most demand planning processes are not adequate to deal with the present day economic volatility" and that "understanding the effects of sales promotions, marketing events and economic factors is more critical than ever". The same point of view is shared by Makridakis (1987). According to this author it is not enough to look at tendencies of past data, but also to understand the impacts that future events may have when forecasting. He also argues that "marketing staff tend to produce optimistic forecast due to their need to believe sales are likely to improve from a better marketing effort" while "sales forecasters are often seen as pessimistic" so as to "protect themselves from criticism". In order to anticipate key elements, factors such as "the firm, the environment, the market, and the competition" should be previously analyzed.

Turning into a specific part of the *Dynamic Forecasting* Process- the Demand Planning - Chase (2009) defended that many companies today determine the demand forecast on professional judgment as "a way to meet their needs" or to "justify sales targets based on stretch goals". Still, most of the demand planners think that by doing so they are actually "enhancing the accuracy of the forecast". Chase (2009) also stresses the importance of the Consensus Forecasting on the process of Demand Forecasting, since it "requires each functional department to submit its version of the demand forecast to create a final consensus demand plan". This "final consensus demand plan" is one of the main pillars on Nestlé's *Dynamic Planning* Process which will be referred later on.

The Dynamic Forecasting Process

In a world where nothing is constant and what yesterday was seen as possible and viable and now is seen as outdated and impractical it is of major importance for companies to be able to anticipate the market tendencies rapidly and effectively in order to maintain its competitive positioning. Thus, being able to build and maintain a strong customer relationship is a powerful contributor to a company's ability to manage through rough times. In order to do this, companies wanting to thrive nowadays should implement *Lean processes*[1] by examining and reengineering their *Customer Relationship Management* (CRM)[2] processes. For this purpose arises the need for a process reengineering as a way for companies to implement their *Enterprise Resource Planning* (ERP) software and thus help reallocate resources on the most strategic and value-adding way.

Aiming for this, Nestlé implemented the GLOBE Framework with a new ERP software SAP ("Systems Applications and Products") that allows corporations to interact through a common database. GLOBE - *Global Business Excellence* - was the application of the concept of *Process Reengineering* in Nestlé. This one is based on three main goals: Implementation of best practices of the processes from the different markets in a harmonized global way; the use of standardized information; the exploitation of a unique information system covering the entire Nestlé. Currently, GLOBE covers a series of *End-to-End* processes[3] namely the *Dynamic Planning* Process.

[1] Lean Processes intends to split processes through processes that indeed create values and the ones that don't.
[2] Customer Relationship Management is a way of managing information regarding all the various aspects concerning their customers, such as sales prospects, customer service, or even marketing.
[3] *End-to-End* processes consist on the elimination of steps within a process so as to enhance its efficiency.

- The Dynamic Planning Process

The *Dynamic Planning* Process comprises the alignment between the Management Business Strategy (which consists on an analysis of each business unit and the economic environment so as to decide on what should be the long term strategies to pursue within the organization for the following three years) and the *Dynamic Forecasting*, Demand Planning, and *Monthly Business Planning* processes.

This process intends to replace the old Operational Plan process by combining actual and forecasted data based on a rolling 18 months planned Income Statement, first arranged by business unit and then aggregated for whole businesses.

The *Dynamic Forecasting* comprises information from Marketing & Sales, Finance, and Supply Chain, which has then to be aligned with the Integrated Commercial Planning and Consensus Demand Planning, within the same portfolio. Consensus Demand Planning represents a collaborative process designed to bring together the interdependent assumptions of three plans originated from the Business Strategy: the Integrated Commercial Plan (where business plans are set), led by Generating Demand Department; the Dynamic Forecast, led by Finance; and the Demand Plan, led by Supply Chain. To ensure the consistency of all activities, these decisions must all be based on one single estimate – the *Consensus Demand Plan*. This "One Number" principle does not mean that there is literally one number that the former departments use but rather that there is one set of related numbers derived from a single source: the Demand Plan.

At Nestlé, the process performance of Demand Planning is measured by the KPIs[4] *Demand Plan Accuracy* and Demand Plan Bias. Zones, markets and, most importantly, Demand Planners monitor the values closely and compare them to targets.

So that all information may be effectively aligned the *Dynamic Forecasting* assumptions (defined as Medium Term Strategy Directions) need to be revised on a monthly basis, so as to ensure that all strategies are in alignment with changes that may have taken place or are expected to occur, within the business, or even surrounding it. This monthly revision, called the *Monthly Business Planning*, defines the Short Term Tactical Direction, by enabling all business areas to operate with a single set of aligned plans and assumptions.

- **The Monthly Business Planning**

The *Monthly Business Planning* (MBP), as it was referred in the broader concept of the *Dynamic Forecasting*, represents a cross-functional process under joint responsibility and leadership of the Supply Chain, Sales & Marketing and Finance & Control functions. So, by challenging integration between functions, it enables all the four departments to operate with a single set of aligned numbers/assumptions.

The process encompasses a full 18 months financial review done once a year and monthly reviews of shorter horizons. These monthly reviews consist on a set of four meetings where volumes, gaps and possible impacts are aligned so as to come up with a consensus "One Number" volume. The MBP meetings are held in sequence starting with MSR in week one and the cycle will only be completed by the end of the month, as follows:

[4] Key Performance Indicators.

- **Monthly Sales Review (MSR) –** following a 3 months approach (only high level information used for the rolling 18-months forecast), it consists on consolidating customer plans, reviewing the details for the upcoming 3 months sales and marketing activities, and gathering competition and market information, so as to achieve aligned sales plans and agreed sales volumes to be discussed on the next meeting (MGR).

  Participants[5] include Marketing, Sales, Decision Support, Demand & Supply Planners and Finance & Control.

- **Monthly Gap Review (MGR) –** resorting to a 3-6 months approach, it also covers the consolidation of the expected trade activities for the upcoming 3 months (as it is done in the MSR), review of key customer information and simulation of the financial actual results so as to achieve proposed scenarios and volumes to be presented during the next meeting (MFR). The purpose of this meeting is to review the 18-months Demand Plan, promote gap's closing, present risks and opportunities and assess alignment of the *Dynamic Forecasting* with the Management Business Strategies. Participants include Sales, Marketing, Demand Planner and the Business Executive Manager.

- **Monthly Forecast Review (MFR) –** using the months that are still ahead in the current year, as well as the upcoming year (but focusing on the details only for the next 4 to 6 months) it provides analysis on the proposed scenarios stretched on the previous meeting and the impacts from changes in strategies, so that they reach the signoff *Dynamic Forecasting* (18-months Business Plan) and Consensus Demand Plan, based on the "One Number" Principle. Participants include Sales, Marketing, Supply Chain, Finance & Control, and the Business Executive Manager.

[5] Usually there is present at least one member of each referred department.

- **Monthly Operations Review (MOR) –** aligning Demand and Supply for the upcoming 18 months, with all the assumptions included, this meeting intends to review demand capacity, supply situation and purchase so as to get a forward looking perspective and identify operational issues/solutions that may impact the value chain (e.g. capacity constraints, raw and packaging material shortages, etc.). Participants include Sales and the Business Executive Manager or the Country Business Manager (when it applies).

- The Dynamic Planning Framework

The *Dynamic Forecasting* (DF) Process and, more precisely, the *Monthly Business Planning*, come as a backbone to implement successfully the *Dynamic Planning Framework* (DPF) within Nestlé, which shall be completely implemented by 2012. Furthermore, and as has already been explicit, there are a series of contributors that not only influence the *Monthly Business Planning*, and consequently the DF, but also contribute to this implementation of the DPF, namely the *Monthly Business Planning* Dashboard. This latter one serves as a tool created for the series of the four mentioned reunions and helps analyzing the diverse risks and opportunities for each business.

The *Monthly Business Planning* plays a crucial role on the *Dynamic Planning Framework* and thus it is important that the way the process undergoes takes into account the established "Best Practices" which aims to improve the effectiveness of planning through a solid and standard planning process, helps aligning full cross-functionality within the planning process, and keeps the focus on the identification of gaps and opportunities,

far beyond the simple discussion of volumes. MBP "Best Practices" contains the best practices for each of the meetings of the monthly planning process and proposals agenda to guide the markets in the implementation of the MBP process. Throughout the "Best Practices" it is essential to work as team and to make an effort in the way of being able to elaborate more stringent forecasts, closer to reality and properly justified, even if the environment is of great uncertainty and indecision.

Bearing this in mind the best approach to follow in this Work Project would be to seek improvements that may be essential for enhancing efficiency to the whole process. In this sense the best way to contribute positively would be to attend the four meetings that part the *Dynamic Forecasting* Process and understand what drawbacks could be taken from the experience. Due to the fact that the MSR is the meeting with the higher level of detail, amount of effort and time spent, only the Monthly Sales Review Meeting will be subject to review.

Limitations and Proposals for Intervention

- **Monthly Sales Review Meeting: risks and opportunities**

With the rationale of understanding in a more practical way how the process undergoes the best solution was to attend a MSR Meeting, in this case, from the Beverages Business.

In a nutshell it was possible to observe that all the previously referred participants were present, no more no less, and that the meeting was well scheduled, since it had already been defined (through standards) what the main topics to cover should be.

Nevertheless, there was some lack of alignment on the access to the information provided to all participants since a great part of the time was spent discussing some occurrences that had happened in the past and that were not yet well explained, as well as there was some new information that not all of the participants knew yet.

For this purpose for the following meetings it should be created a "central data bank" that would not just work as a singular source to download documents (as the company already has it - the "Team Room") but also to serve as a source of new information that some department may be aware and the others don't (such as cases of stock shortage, among others). The organization should decide in advance what types of data might possibly be relevant for each type of strategic decision. The important information would be collected routinely and stored in this "central data bank".

Another recommendation would be to previously send the PowerPoint presentation that will be used for the meeting since it would be a way for the participants to do a forehand analysis on the main information that will be covered. If successful and aligned with the required "Best Practices" this solution could prevent a very time-consuming reunion.

As a final point, the last issue to be covered regards the volumes forecasted for each month. In this case, and as it was already referred on Chase (2009) statements, many volumes are reached through the use of judgmental aspects, such as applying a number as close as possible to the target one which would, aftermost, affect the forecasts' accuracy. So, as Chase (2009) also defended, it should be conducted a "forecast value added analysis" to "determine if value was added to the statistical baseline forecasts when manual overrides are made, by all individuals in the demand forecasting process". The objective would be "to measure the Demand Plan Accuracy of the demand forecast before and after, to

determine if it improved or not. The purpose would not to punish people if they did wrong, but to work together as a way to improve the forecasts' quality." (Chase, 2009)

- *Nescafé Dolce Gusto* Case – Improving Demand Plan Accuracy

As it may be known, Nescafé is not just a particular brand, but the world's leading coffee brand, being present in more than 120 countries. As for the specific *Nescafé Dolce Gusto ("NDG")*, a new single-cup coffee system which emerged from the union between *Nescafé* and *Krups*, it is the national market leader with a market share of about 30% in machines and 55,4% in volume of capsules by June 2011 (Source: *GfK* data*)*.

However, what shall be stressed out in this project is not the product/brand *per se*, but the way the sales of *Nescafé Dolce Gusto* capsules are forecasted within Nestlé Portugal.

For a few months now, Nestlé Demand Planners have been trying to fit sophisticated models with SAS forecast server[6] in order to improve the demand plan and its two key performance indicators (KPIs): the *Demand Plan Accuracy* (DPA) and bias (please refer to *Appendix 1* for detailed information on these KPIs calculation).

The current results are already satisfactory, with DPAs over 50% (please refer to *Appendix 2* for historical information on *"NDG"* KPIs) but much potential can still be extracted from this process, particularly when it comes to forecasting *Nescafé Dolce Gusto* capsules' sales given the actual data from the *Nescafé Dolce Gusto* machines' sales. In order to accomplish this task, data were collected and gathered so as to follow with a regression analysis on these variables.

[6] "Software responsible for choosing automatically the most appropriate model, optimizing the model parameters and producing the forecasts" which can "save organizations significant time and resources". – SAS Forecast Server Website.

Methodology

In order to build a statistical model that would help forecast coffee capsules' sales using historical data, such as machines' sales, some regressions were computed.

Past data from *Nescafé Dolce Gusto* capsules' historical sales (provided by Nestlé) was gathered, since its inception, as well as *Dolce Gusto* machines' sales. To enhance the model it was added historical data of the prices on the raw material coffee (Source: *Eurostat*) and (in Euros) the investment made by Nestlé in *Nescafé Dolce Gusto* capsules promotion (data provided by Nestlé).

These variables were considered as the most suitable ones since ultimately sales will be driven by the price of capsules - given that the consumers are price sensitive – which is directed correlated to the price of its raw material such as coffee prices, and the promotion that the company does to induce people to buy their products.

Although difficult to measure its impact it is expected that the more investment made by Nestlé in promoting *Dolce Gusto*, higher will be the capsules' sales.

However given the access limitation to past data of machines' sales some assumptions were made. Regarding the *Nescafé Dolce Gusto* machines' sales the only data available was that, until mid-2011, since the brand's inception there had been sold approximately 250.000 machines and that the average market share had been approximately 30% for the previous years. Also some consumer research studies suggest that people tend to buy more machines during the first quarter of the year and especially in the last quarter given the Christmas holidays and sales. Moreover, it is known that by 2009 it was sold in national territory approximately 130.000 coffee machines and that sales increased about 60% (Source: *Gfk* data) since then. Machines' sales per year are as follows in *Table I*.

Taking into account the soaring sales during the first and fourth quarter of the month, it was assumed that 30% of total sales were made during the first quarter and 40% during the fourth quarter (and then both of them split per month). The remaining amount of sales was equally-weighted through the other months.

Table I - Nescafé Dolce Gusto machines' sales

Year	Estimate	Standard Error
2011	**74.880 €**	(60% increase from 2009)
2010	**46.800 €**	(20% increase from 2009)
2009	**39.000 €**	(=30% market share * 130.000 machines)
2008	**33.621 €**	(16% increase from 2008 to 2009)
2007	**28.017 €**	(20% increase from 2007 to 2008)

Assumptions made by data from Gfk

With all the available data gathered a regression analysis was computed, including the following variables: Independent Variables (monthly means) - *Nescafé Dolce Gusto* machines' sales (in units), Coffee (as raw material) Prices (in euros) and *Nescafé Dolce Gusto* capsules' investment on promotion (in Euros); Dependent Variable (monthly means) – *Nescafé Dolce Gusto* capsules' sales (in units).

Results

When attempting to forecast coffee capsules' sales, resorting only to its coffee machines' sales, even though at first the relationship between these two variables was providing an extremely low coefficient of determination ((R^2)[7] of approximately 2% (for detailed information on some of the regressions' outputs please refer to *Appendix 3: Regression 1*), when introducing a backward looking on the monthly coffee machines' sales data it enhanced the r-squared of the regression model to over than 42%.

[7] "R^2 represents the ratio of the explained variation compared to the total variation; thus it is interpreted as the fraction of the sample variation in the dependent variable that is explained by the independent variable. The value of R^2 is always between zero and one." (Jeffrey M. Wooldridge, 2006)

The enhanced regression model, using the method of *Ordinary Least Squares* (OLS) is as follows in *Equation I:*

$$log(number\ "NDG"capsules\ sold)_n = b0 + b1\ log(number\ "NDG"machines\ sold\ _{n-1}) + \varepsilon \quad \text{(I)}$$

Where "*Nescafé Dolce Gusto* capsules' sales" (in units) represent the dependent variable, the units of *Nescafé Dolce Gusto* machines sold the independent variable and ε the remaining unobserved factors (for detailed information on this regression's output, please refer to *Appendix 3: Regression 2*). It is important to highlight the R-squared of approximately 42%, and the output's p-values[8] that showed as statistically significant confirm the substantial relationship between these two variables.

The results obtained through the previous regression model are aligned with what was expected, since capsules sales are directly related with all the coffee machines available in the market.

Additionally, the backward looking regression (with lag of one period) illustrates the fact that there isn't an immediate increase on the consumption of capsules when the machines are sold but only on the following period.

Moreover, it should be accounted the use of the logarithmic function on both variables, which caters for limiting the effects of "outliers" (extreme values of variables) throughout the regression model.

[8] Which, for a Confidence Intervalo f 95%, in order to be statistically significant, have to be below the confidence level (in this case, being 5%).

When resorting to a single regression model, such as the latter one, one comes across with one of the primary drawback of using only one explanatory variable which is the distress of having to draw any type of conclusions, *ceteris paribus*, of how only one variable *x* affects another variable *y*. To enhance the forecasting accuracy of the model it was included more variables using a multiple regression model.

The parameters estimated were the number of *Dolce Gusto* machines sold, the investment done on promoting the capsules and the historical prices of the raw material coffee, which resulted into the regression model as follows in *Equation II:*

$$\text{Log (number "}NDG\text{"capsules sold}_n) = b0 + b1\log(\text{number "}NDG\text{"machines sold }_{n-1}) + \text{b2(coffee price }_{n-2}) + \text{b3(investment on capsules promotion}_{n-1}) + \varepsilon \quad \text{(II)}$$

Where "*Nescafé Dolce Gusto* capsules' sales" (in units) represents the dependent variable and the remaining variables correspond to the independent variables. For detailed information on the regression's output, please refer to *Appendix 3: Regression 3.*

With an R-squared of approximately 64% the results of the regression are as follows in *Table II*:

Table II - Ordinary Least Squared Estimators (Results)

Parameter	Estimate	Standard Error	T-statistic	P-value
β0	2,204752	0,392	5,623	0,0000011
β1	0,331070	0,140	2,358	0,0226878
β2	0,017235	0,004	4,545	0,0000398
β3	0,000002	0,000	2,548	0,0142432

Analyzing in detail each coefficient and each variable one can perceive that the number of "*NDG*" capsules sold will increase by approximately 0,33% on average, *ceteris paribus*, if the number of *"NDG"* machines in the previous period (represented by the coefficient *β1***)**, increases by 1% unit.

Regarding the other two independent variables it is possible to identify that the number of *"NDG"* capsules sold will increase by 1,72%, on average, *ceteris paribus,* if the price of the coffee two periods ago goes up 1 euro, while it will increase by 0,002%, on average, *ceteris paribus,* if investment made on the previous period in capsules promotion increases by 1 euro.

Furthermore when examining the overall regression model one can conclude that the variables included are all statistically significant (with p-values quite below from the standard confidence level of 5%), and that all of them help explain more than 60 percent of the dependent variable, information provided by the analysis of the coefficient of determination.

It should also be highlighted the importance of analyzing, not only the R^2 *per se*, but also the adjusted R-squared.

The adjusted R-squared, as opposed to the R-squared, takes into account the number of variables in a model, and may decrease if the number of variables increases. So, when analyzing the adjusted R-squared of 61,5% although being smaller than the R-squared it still shows the efficiency of the obtained regression model. This also happens because it was not included too many variables that could justify a severe change on this R-squared.

Following the regression analysis it is essential to understand how to relate the actual values of *Dolce Gusto* capsules' sales, with the ones provided by the obtained regression model.

Focusing on the year 2010 since, besides being one of the most recent years it is also the one with all available data for each month. The main conclusions that can be withdrawn from this analysis are as follows in *Table III*:

Table III: Deviations from actual and predicted values (*Nescafé Dolce Gusto* capsules, in units)

Year	% monthly average	absolute value/year	absolute value/month
2010	-20,66%	856.104	71.342

The results obtained from this comparison reflect the fact that the regression model is forecasting lower values than the actual values (with a deviation of approximately 21%). This should be expected, given that the variables included in the model do not completely explain the dependent variable (R-squared is 64% and not 100%), and there may other variables that could help explain such difference.

Also another fact that could help explain this deviation would be the fact that people do not follow a trend path and some of them do buy by impulse and thus make it harder to measure those consumers' behavior.

Finally, there may have been a particular month during the year where capsules sales were quite above from the trend, creating a deviation that will reflect on the average deviations during the year. For detailed information on the monthly comparison analysis, please refer to *Appendix 4, Table I.*

Conclusion

In the actual economic environment it is necessary to implement a disciplined, agile and efficient business planning process to support the decision making process.

By increasing transparency, consistency and discipline in the Business Planning Process the organization is not only in a position to identify gaps and react timely but creating a real and competitive gap versus its competitors.

The *Dynamic Planning* Process, working a stress test of business plans, boosts speed to decision making, creates visibility to what's ahead and the range of possible outcomes, and focuses on the most important drivers of business performance.

Furthermore, it is a process owned at local levels but with a clear alignment with stakeholder/investors expectations and shareholder value creation, allowing for its effectiveness and credibility.

When it comes to planning Supply Chain knowledge, this is more critical than ever, especially when dealing with a multinational organization as Nestlé. So, all efforts that can be done in order to improve the accuracy of demand planning and thus the efficiency of the supply chain and the whole organization should not be ignored.

The main intention of this Work Project was to contribute with solutions that could be taken to improve, not only the Nestlé's Demand Plan Accuracy, but to help increase efficiency when trying to anticipate risks and opportunities on the overall *Dynamic Planning* Process.

For this purpose, it was computed a regression analysis on the *Nescafé Dolce Gusto* capsules' sales, so that a more accurate forecast could be drawn from the analysis. In order to accomplish this there were taken into account three main variables that directly influence coffee capsules' sales: coffee machines' sales, prices of the raw material coffee, and the amount invested on the promotion of those capsules.

Through the obtained results it was possible to demonstrate that even though the chosen variables explain most of the capsules' sales, deviations on the actual and predicted values reflect that there could be other variables to take into account and that could be relevant to the model. Also, consideration must be taken on the consumers' unpredicted behavior that does not necessarily react according to a certain path trend.

Though just a small contribution in the extended and complex area of business planning, this Work Project endeavored to demonstrate that it is not enough to lean on past data and hope that the actual results will turn out as expected, and it is not enough to take second guesses as an escape plan. If the organization does anticipate its constraints and its needs then it will provide more efficient resources reallocation, improved customer service, and greater efficiency on planning. But, most of all, it will be enhancing value and the way it is perceived throughout the world.

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Appendices

Appendix 1 - Formulas

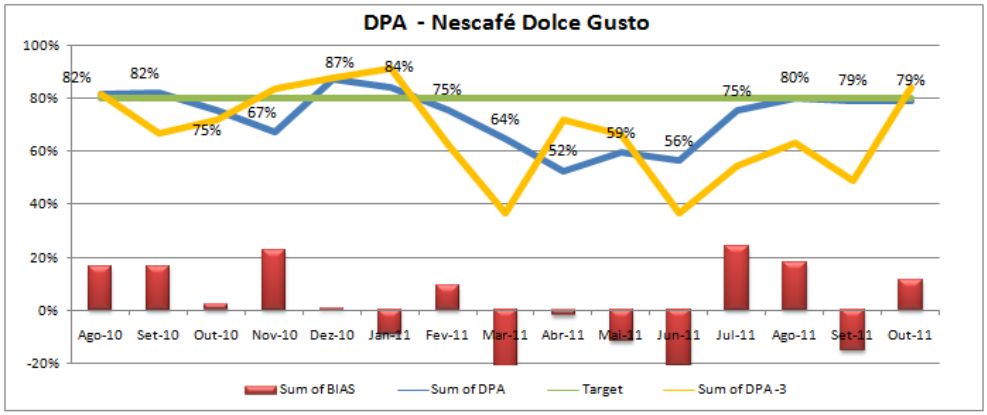
Demand Plan Accuracy Formula:

$$\text{Accuracy (\%)} = \left(1 - \frac{\Sigma \text{ ABS (Demand Plan} - \text{Actual Demand)}}{\Sigma \text{ Demand Plan}}\right) \times 100\%$$

Bias Formula:

$$\text{Bias (\%)} = \left(\frac{\Sigma \text{ (Demand Plan} - \text{Actual Demand)}}{\Sigma \text{ Demand Plan}}\right) \times 100\%$$

Appendix 2[9] - *Nescafé Dolce Gusto* historical Demand Plan Accuracy



[9] DPA: Demand Plan Accuracy one month ago; DPA-3: Demand Plan Accuracy three months ago.

Appendix 3 – Regressions Outputs

Regression 1

Regression Output (Dependent Variable: log(Units of "*NDG*" Coffee Capsules sold in period t); Independent Variable: log(Units of "*NDG*" Coffee Machines sold in period t))

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,142006615
R Square	0,020165879
Adjusted R Square	-0,000247332
Standard Error	0,680534866
Observations	50

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,457516318	0,457516318	0,987883718	0,325244414
Residual	48	22,23012979	0,463127704		
Total	49	22,68764611			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	3,76317099	1,418807319	2,652348166	0,010802067	0,910467732	6,615874249	0,910467732	6,615874249
X Variable 1	0,392659595	0,395060219	0,993923397	0,325244414	-0,401662199	1,186981389	-0,401662199	1,186981389

Regression 2

Regression Output (Dependent Variable: log(Units of "*NDG*" Coffee Capsules sold in period t); Independent Variable: log (Units of "*NDG*" Coffee Machines in period t-1)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,650152008
R Square	0,422697633
Adjusted R Square	0,410670501
Standard Error	0,522367044
Observations	50

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	9,590014316	9,590014316	35,14533729	3,22516E-07
Residual	48	13,09763179	0,272867329		
Total	49	22,68764611			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	2,40309989	0,47255184	5,08536779	0,00000602	1,4529708	3,3532290	1,4529708	3,3532290
X Variable 1	0,78951481	0,13317614	5,92835030	0,00000032	0,5217462	1,0572834	0,5217462	1,0572834

Regression 3

Regression Output (Dependent Variable: log(Units of "*NDG*" Coffee Capsules sold in period t); Independent Variables: log (Units of "*NDG*" Coffee Machines in period t-1) (Variable 1); Coffee Prices from period t-2 (Variable 2); Promotion from period t-1 (Variable 3)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,798639
R Square	0,637824253
Adjusted R Square	0,614204096
Standard Error	0,422644757
Observations	50

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	14,47073093	4,823576978	27,00338706	3,18307E-10
Residual	46	8,216915177	0,178628591		
Total	49	22,68764611			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	2,204752	0,392080269	5,623215644	0,0000011	1,415535267	2,993968538	1,415535267	2,993968538
X Variable 1	0,331070	0,140410229	2,357876033	0,0226878	0,048438786	0,61370104	0,048438786	0,61370104
X Variable 2	0,017235	0,00379232	4,544778535	0,0000398	0,00960171	0,024868799	0,00960171	0,024868799
X Variable 3	0,000002	7,69391E-07	2,547890809	0,0142432	4,1162E-07	3,50903E-06	4,1162E-07	3,50903E-06

Appendix 4 - Tables

Table I: Comparing Actual Values with Predicted Values

		Actual Capsules (units)	Predicted Capsules (units)	Absolute Deviation (units)	Variation (%)
2010	Jan	253.631	473.378	-219.747	87%
	Fev	226.329	160.882	65.447	-29%
	Ma	311.529	304.735	6.794	-2%
	Abr	344.011	228.487	115.524	-34%
	Mai	194.193	137.643	56.550	-29%
	Jun	461.326	149.436	311.890	-68%
	Jul	229.269	133.609	95.660	-42%
	Ag	342.849	143.922	198.927	-58%
	Set	361.689	140.444	221.245	-61%
	Out	430.125	152.134	277.991	-65%
	No	434.342	533.688	-99.346	23%
	Dez	592.734	767.565	-174.831	29%